US008456314B2

(12) **United States Patent**
Arling et al.

(10) **Patent No.: US 8,456,314 B2**
(45) **Date of Patent: Jun. 4, 2013**

(54) **SYSTEM AND METHOD FOR RECONFIGURATION OF AN ENTERTAINMENT SYSTEM CONTROLLING DEVICE**

(75) Inventors: **Paul D. Arling**, Irvine, CA (US); **Patrick H. Hayes**, Mission Viejo, CA (US)

(73) Assignee: **Universal Electronics Inc.**, Santa Ana, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 778 days.

(21) Appl. No.: **12/621,277**

(22) Filed: **Nov. 18, 2009**

(65) **Prior Publication Data**

US 2011/0074591 A1 Mar. 31, 2011

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/569,121, filed on Sep. 29, 2009, now Pat. No. 8,243,207.

(51) **Int. Cl.**

G08B 1/08	(2006.01)
G08B 21/00	(2006.01)
G08C 19/06	(2006.01)
G08C 19/12	(2006.01)

(52) **U.S. Cl.**

USPC **340/635**; 340/509.1; 340/540; 340/12.5; 340/13.1; 340/13.24; 725/80; 725/81; 725/85; 725/139; 725/141

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,959,751	A	9/1999	Darbee et al.	
6,784,805	B2	8/2004	Harris et al.	
6,910,085	B2	6/2005	Takaku et al.	
6,918,136	B2 *	7/2005	Shepherd	725/141
6,930,730	B2	8/2005	Maxon et al.	
7,119,710	B2	10/2006	Hayes et al.	
7,155,305	B2	12/2006	Hayes et al.	
7,586,398	B2	9/2009	Huanget et al.	
2002/0194621	A1 *	12/2002	Tran et al.	725/139
2003/0234737	A1	12/2003	Nelson et al.	
2004/0004630	A1	1/2004	Kalva et al.	
2004/0070491	A1	4/2004	Huang et al.	
2004/0117843	A1 *	6/2004	Karaoguz et al.	725/108
2005/0034160	A1 *	2/2005	Kim et al.	725/80

(Continued)

FOREIGN PATENT DOCUMENTS

EP	2091246 A2	8/2009
GB	2275800	7/1994
JP	2009171232	7/2009

OTHER PUBLICATIONS

WIPO, International Preliminary Report on Patentability of PCT Appln. No. US2010/050614, Apr. 3, 2012, 6 pages.

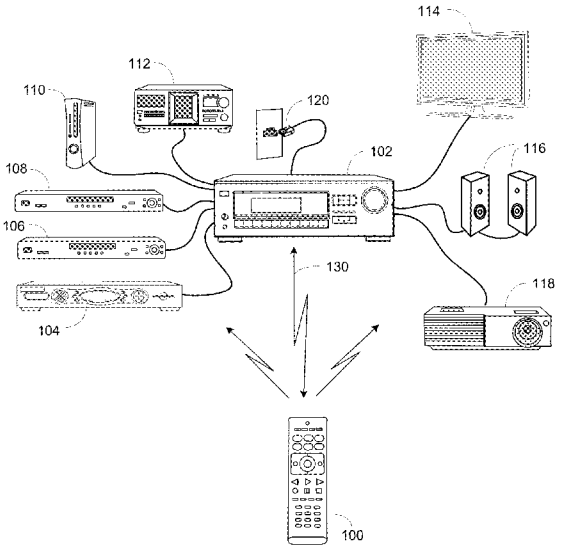
Primary Examiner — Julie Lieu

(74) *Attorney, Agent, or Firm* — Greenberg Traurig, LLP

(57) **ABSTRACT**

An entertainment device is used to notify a user of a change in an audio visual entertainment system configuration in which at least one of a plurality devices is connected to the entertainment device as an audio and/or visual source and at least one of the plurality of devices is connected to the entertainment device as an audio and/or visual output destination for the entertainment device and/or to notify a user of a perceived problem in a configuration of a controlling device used to control functional operations of the audio visual entertainment system.

19 Claims, 8 Drawing Sheets



U.S. PATENT DOCUMENTS

2006/0050142	A1	3/2006	Scott et al.	
2007/0052547	A1	3/2007	Haughawout et al.	
2007/0185597	A1	8/2007	Bejean et al.	
2008/0066123	A1	3/2008	Igoe et al.	
2008/0186078	A1	8/2008	Shintani et al.	
2009/0254966	A1 *	10/2009	Josephs et al.	725/140
2010/0287258	A1	11/2010	Takeuchi	
2010/0309375	A1 *	12/2010	Alexander	348/570
2011/0030016	A1 *	2/2011	Pino et al.	725/80
2011/0106984	A1 *	5/2011	Tanaka et al.	710/16

* cited by examiner

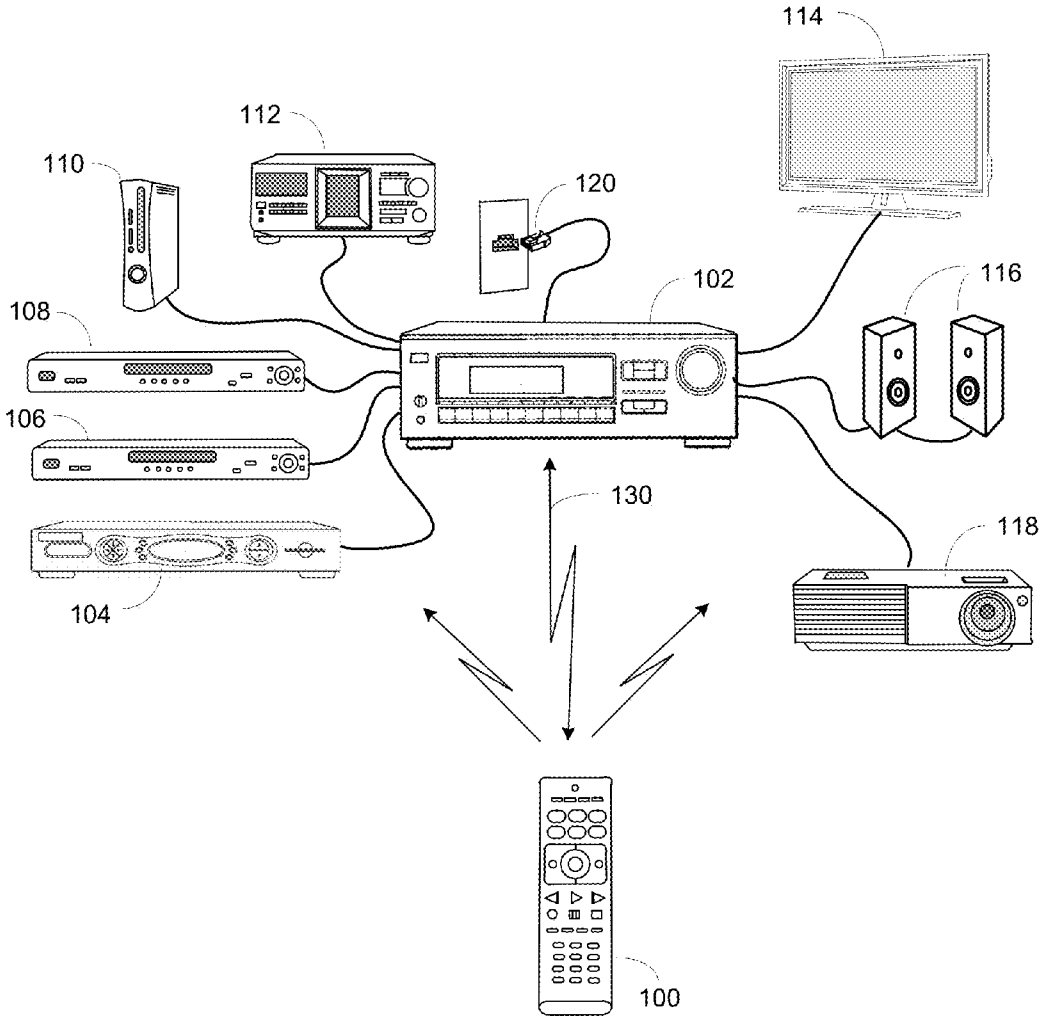


Figure 1

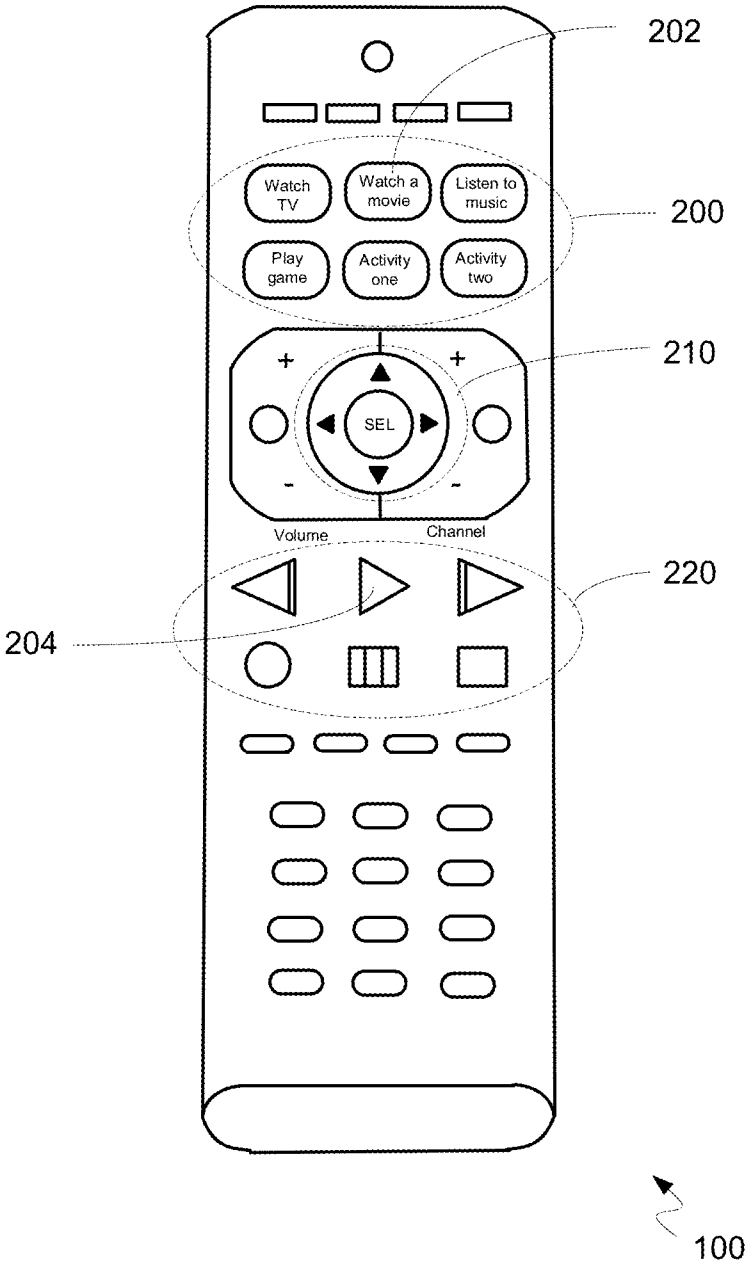

202
Watch TV
Watch a movie
Listen to music
200
Play game
Activity one
Activity two
210
+
+
SEL
-
-
Volume
Channel
220
204
100

Figure 2

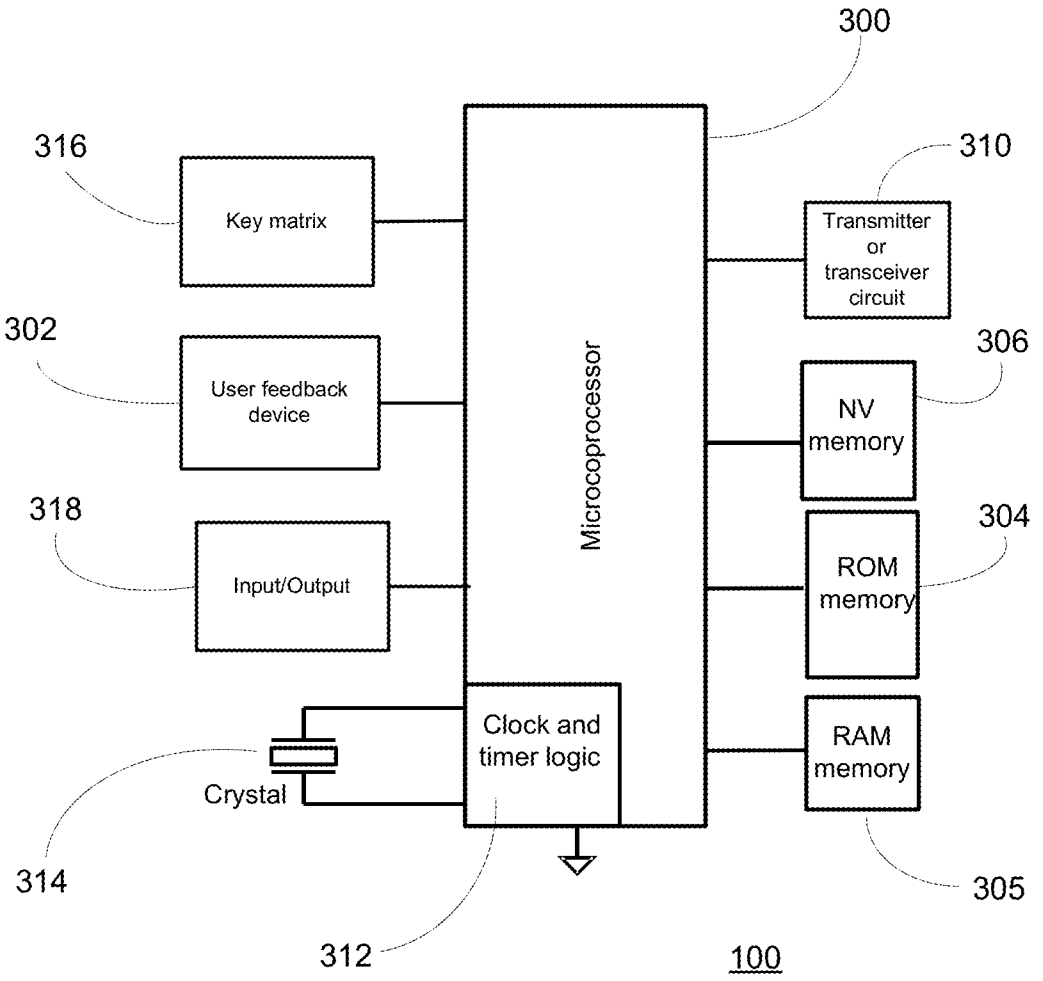

300
316
Key matrix
310
Transmitter or transceiver circuit
302
User feedback device
306
NV memory
318
Input/Output
Microcoprocessor
304
ROM memory
Clock and timer logic
RAM memory
Crystal
314
312
305
100

Figure 3

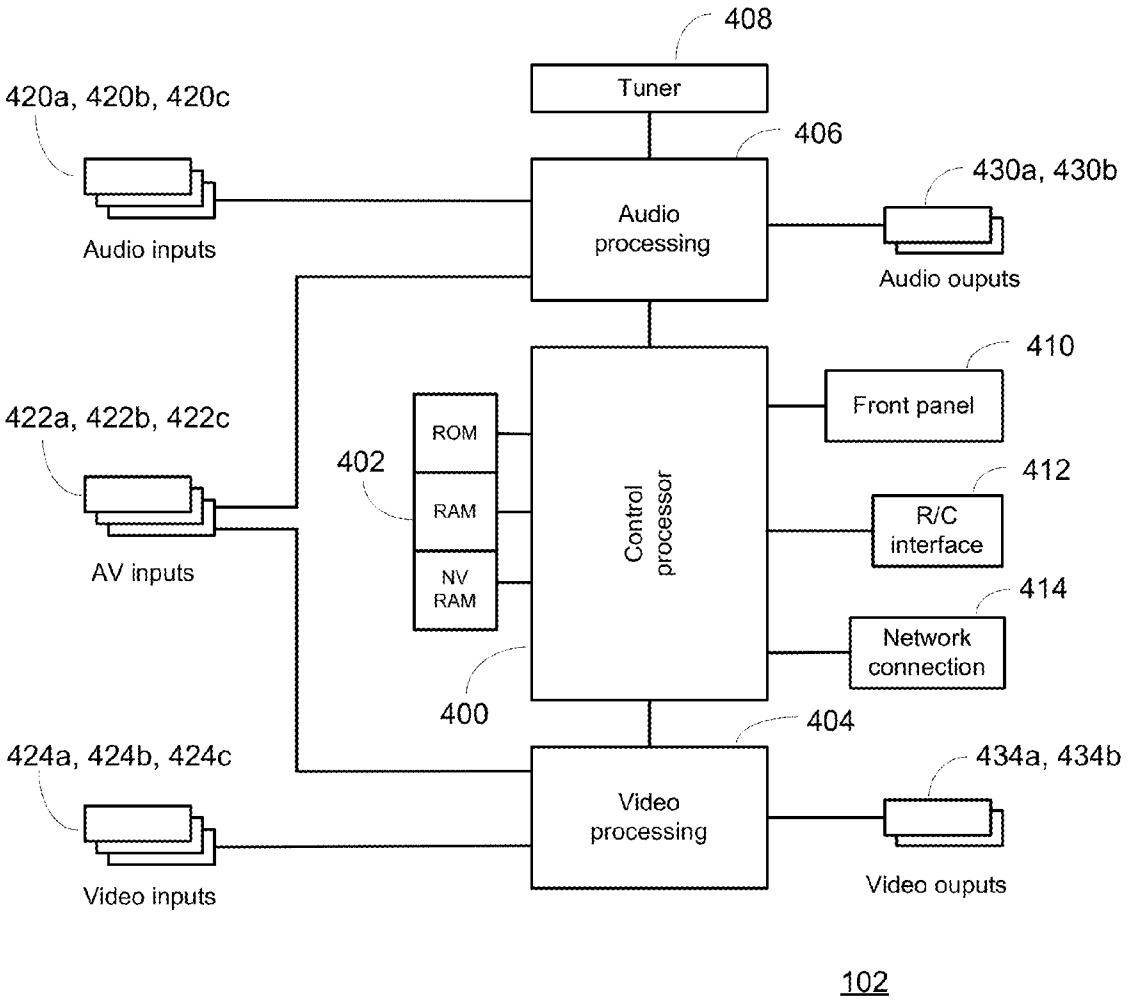

408
Tuner
420a, 420b, 420c
406
Audio inputs
Audio processing
430a, 430b
Audio ouputs
410
422a, 422b, 422c
ROM
402
RAM
Front panel
412
Control processor
R/C interface
AV inputs
NV RAM
414
Network connection
400
404
424a, 424b, 424c
Video processing
434a, 434b
Video inputs
Video ouputs
102

Figure 4

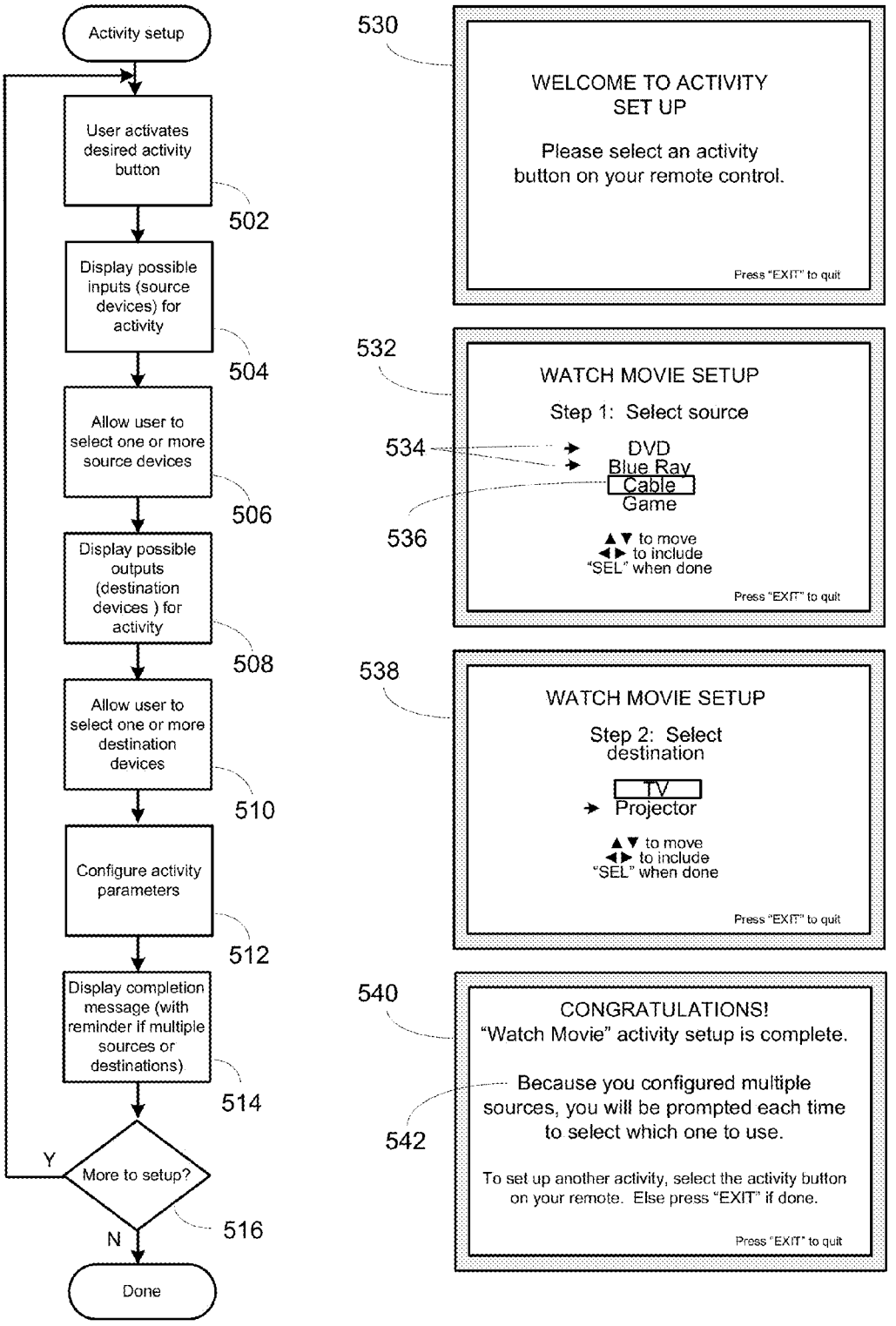

Activity setup
User activates desired activity button
502
Display possible inputs (source devices) for activity
504
Allow user to select one or more source devices
506
Display possible outputs (destination devices) for activity
508
Allow user to select one or more destination devices
510
Configure activity parameters
512
Display completion message (with reminder if multiple sources or destinations)
514
More to setup?
Y
N
516
Done
530
WELCOME TO ACTIVITY SET UP
Please select an activity button on your remote control.
Press "EXIT" to quit
532
WATCH MOVIE SETUP
Step 1: Select source
534
DVD
Blue Ray
Cable
Game
536
▲▼ to move
◀▶ to include
"SEL" when done
Press "EXIT" to quit
538
WATCH MOVIE SETUP
Step 2: Select destination
TV
Projector
▲▼ to move
◀▶ to include
"SEL" when done
Press "EXIT" to quit
540
CONGRATULATIONS!
"Watch Movie" activity setup is complete.
542
Because you configured multiple sources, you will be prompted each time to select which one to use.
To set up another activity, select the activity button on your remote. Else press "EXIT" if done.
Press "EXIT" to quit

Figure 5

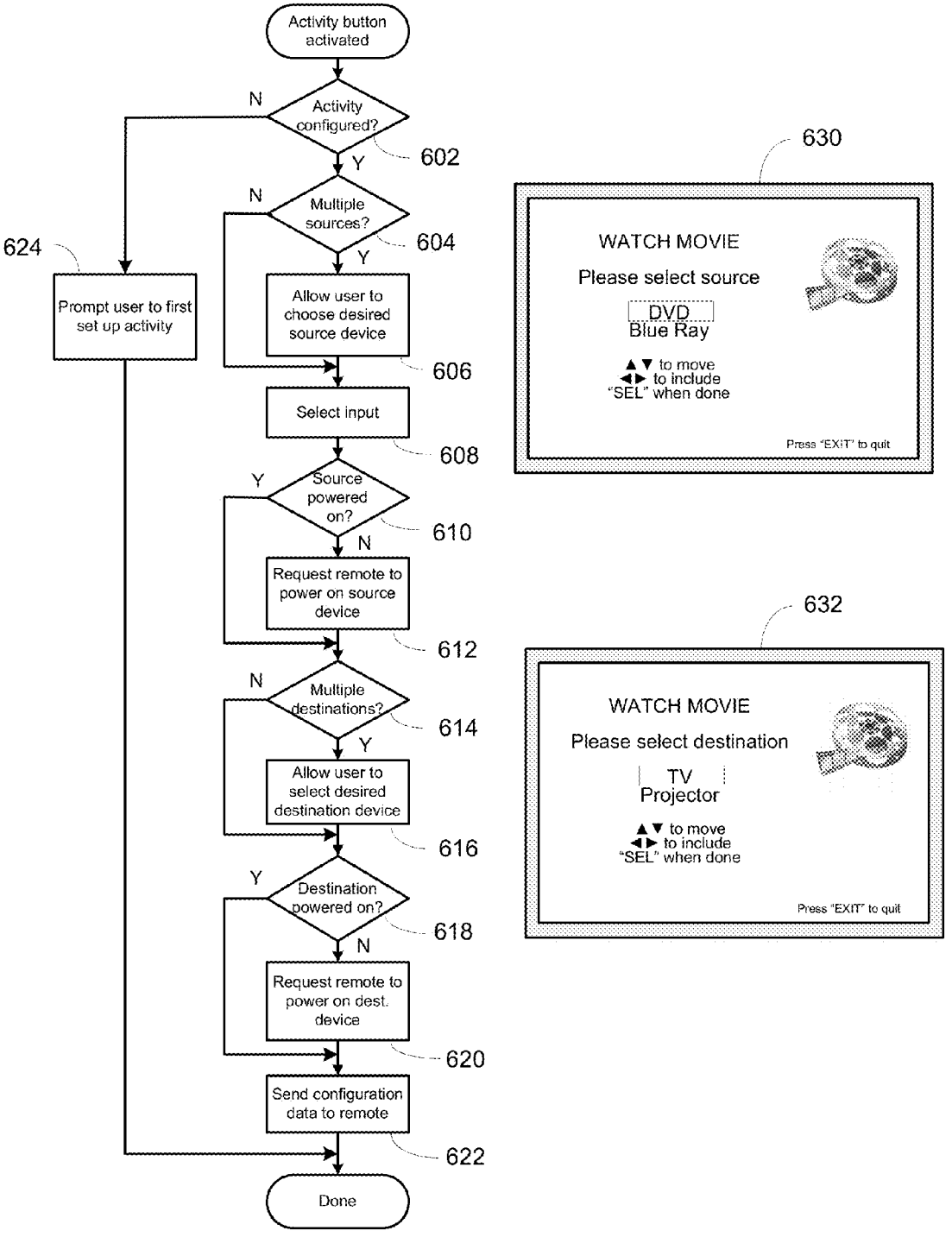

Activity button activated
Activity configured?
N
Y
602
Multiple sources?
N
Y
604
624
Prompt user to first set up activity
Allow user to choose desired source device
606
Select input
608
Source powered on?
Y
N
610
Request remote to power on source device
612
Multiple destinations?
N
Y
614
Allow user to select desired destination device
616
Destination powered on?
Y
N
618
Request remote to power on dest. device
620
Send configuration data to remote
622
Done
630
WATCH MOVIE
Please select source
DVD
Blue Ray
▲▼ to move
◄► to include
"SEL" when done
Press "EXIT" to quit
632
WATCH MOVIE
Please select destination
TV
Projector
▲▼ to move
◄► to include
"SEL" when done
Press "EXIT" to quit

Figure 6

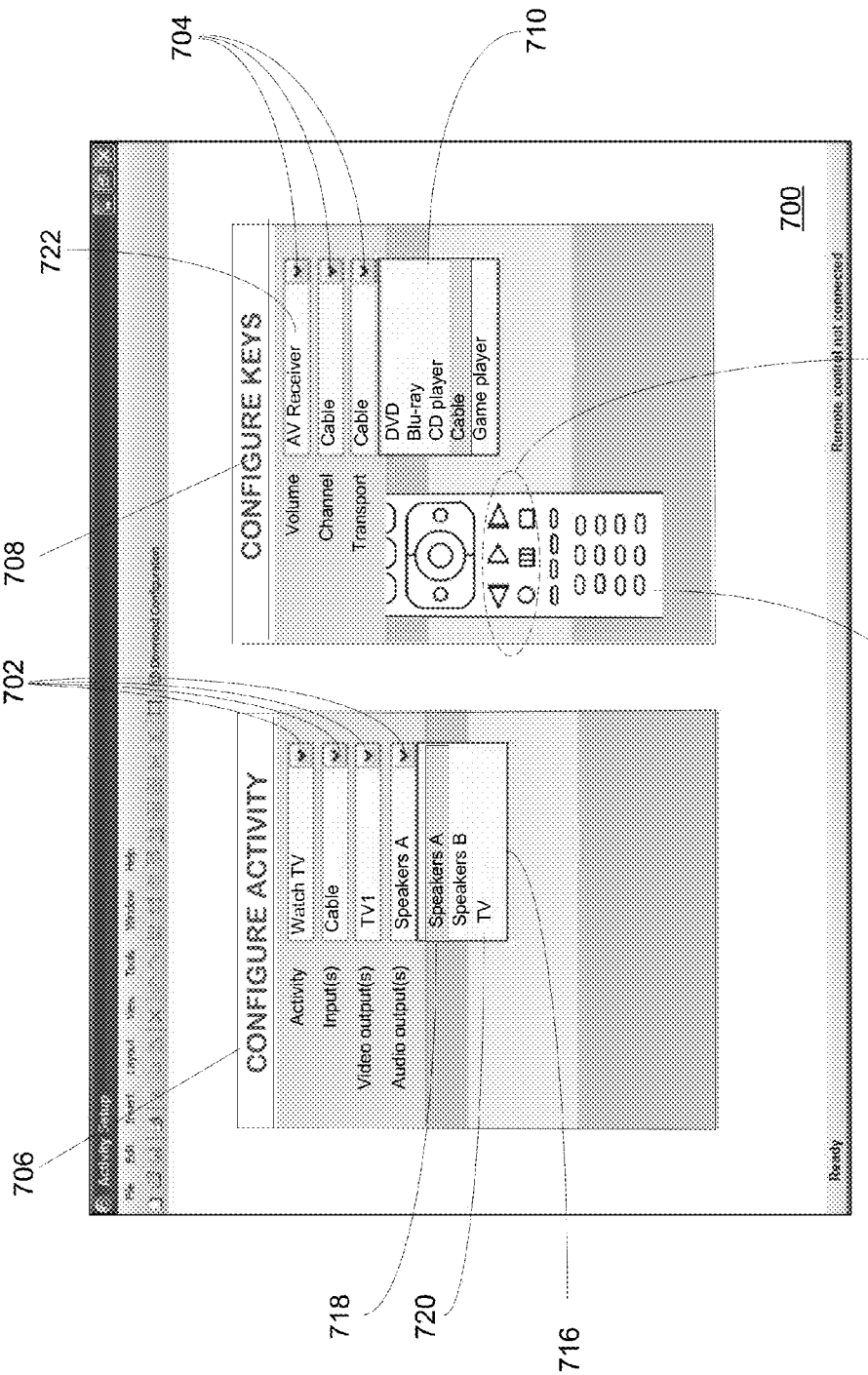

704
710
722
700
714
708
702
712
706
718
720
716
CONFIGURE KEYS
Volume
Channel
Transport
AV Receiver
Cable
Cable
DVD
Blu-ray
CD player
Cable
Game player
CONFIGURE ACTIVITY
Activity
Input(s)
Video output(s)
Audio output(s)
Watch TV
Cable
TV1
Speakers A
Speakers A
Speakers B
TV
Ready
Remote control not connected

Figure 7

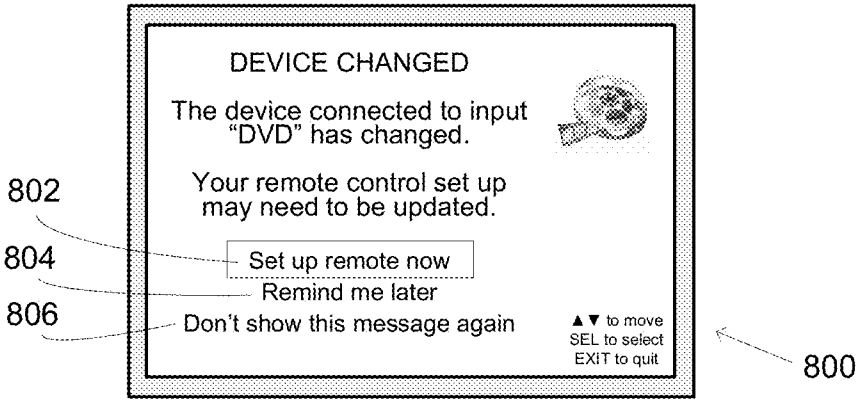


Figure 8

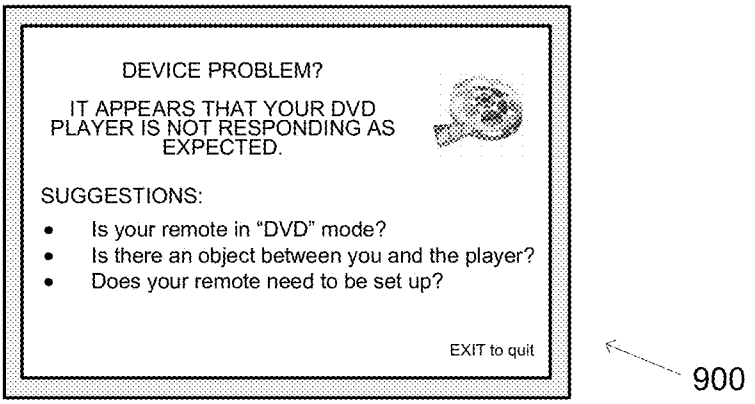

DEVICE PROBLEM?
IT APPEARS THAT YOUR DVD PLAYER IS NOT RESPONDING AS EXPECTED.
SUGGESTIONS:
• Is your remote in "DVD" mode?
• Is there an object between you and the player?
• Does your remote need to be set up?
EXIT to quit
900

Figure 9

SYSTEM AND METHOD FOR RECONFIGURATION OF AN ENTERTAINMENT SYSTEM CONTROLLING DEVICE

RELATED APPLICATION DATA

This application claims the benefit of and is a continuation-in-part of U.S. application Ser. No. 12/569,121 filed Sep. 29, 2009.

BACKGROUND

Home entertainment systems in which multiple media sources and multiple media rendering devices are coupled through a central routing device such as an AV receiver are well known in the art, as are universal controlling devices adaptable to issue commands to a multiplicity of appliances of different manufacture and/or type and which are frequently associated with such home entertainment systems. As these home entertainment systems become increasingly complex due to the proliferation of media formats, appliance types, etc., the user actions required to configure a home entertainment system to match a desired activity such as watching TV or listening to music have become increasing onerous and error prone. Various methods have been proposed for automating all or part of these configuration operations, for example through use of controlling device based macro sequences such as described in U.S. Pat. No. 5,959,751 or state-based control such as described in U.S. Pat. No. 6,784,805. However, such methods may themselves be subject to error when equipment configurations or connections are not as expected, leading only to further user frustration.

SUMMARY OF THE INVENTION

This invention relates generally to improved methods for configuring a multi-input and/or multi-output home entertainment system to match a user's desired activities. In such systems, the outputs and inputs of the various components are generally routed to and switched through one central device such as an AV receiver. The inventive methods described herein comprise a cooperative effort between the AV receiver and an associated universal controlling device such as a remote control in which activation of an activity key or button on the controlling device results in transmission of a signal to the AV receiver to initiate certain previously defined configuration actions, which actions may be conditioned upon the AV receiver's determination of the current status of connected devices. In addition, certain controlling device command transmissions to other appliances in the home entertainment system may also be initiated as a result of said activity key activation, either unilaterally by the controlling device or at the request of the AV receiver. Since the AV receiver has access to appliance status information not available to the controlling device (by virtue of the AV receiver's physical connection to those appliances), and the controlling device in turn has access to appliance command functions not available to the AV receiver, the cooperative execution of an activity configuration request in this manner may result in more reliable and user-friendly system operation. In addition, since prior art initial user set up of AV receivers is generally GUI based and includes assignment of user-friendly names to source and destination appliances (for example, "DVD" in place of "Video input **3**"), a user's initial specification of desired activity configurations may be facilitated by the use of these features when configuring activities.

A better understanding of the objects, advantages, features, properties and relationships of the invention will be obtained from the following detailed description and accompanying drawings which set forth illustrative embodiments and which are indicative of the various ways in which the principles of the invention may be employed.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the various aspects of the invention, reference may be had to preferred embodiments shown in the attached drawings in which:

FIG. **1** illustrates an exemplary system in which the methods of the instant invention may be practiced;

FIG. **2** further illustrates an exemplary controlling device of the system of FIG. **1**;

FIG. **3** illustrates a block diagram of exemplary components of the exemplary controlling device of FIG. **2**;

FIG. **4** illustrates a block diagram of exemplary components of an AV receiver of the system of FIG. **1**;

FIG. **5** illustrates an exemplary activity configuration setup process in accordance with the methods of this invention;

FIG. **6** illustrates an exemplary activity switching process in accordance with the methods of this invention;

FIG. **7** illustrates a second exemplary activity configuration setup process in accordance with the methods of this invention;

FIG. **8** illustrates an exemplary display prompting a user to reconfigure a controlling device upon changing an appliance to be controlled; and

FIG. **9** illustrates exemplary help information which may be presented to a user when it is detected that an appliance is not responding correctly to command requests.

DETAILED DESCRIPTION

Turning now to FIG. **1**, there is illustrated an exemplary home entertainment system in which the audio/video outputs of a group of various media source appliances such as for example a set top box ("STB") **104**, a first DVD player **106**, a second DVD player **108**, a game console **110**, and a CD changer **112** are all connected as inputs to an AV receiver **102**. AV receiver **102** in turn functions to switch the currently desired input media stream to one or more designated outputs of AV receiver **102** which are, in turn, connected to various audio and/or video rendering devices such as TV **114**, projector **118**, and/or loudspeakers **116**; all as is well known in the art. In some embodiments AV to receiver **102** may also include a network interface **12**Q, for example Ethernet, for the routing of streaming media input/output from or to other areas of the home. When included, such a network interface may also be available for Internet access, download of firmware updates and/or other data into AV receiver **102**, etc., again as well known in the art. Also illustrated is a universal controlling device **100** which is capable of transmitting commands to the appliances, using any convenient IR, RF, Point-to-Point, or networked protocol, to cause the appliances to perform operational functions. While illustrated in the context of a home entertainment system, it is to be understood that appliances controllable by universal controlling device **100** may include, but need not be limited to, televisions, VCRs, DVRs, DVD players, cable or satellite converter set-top boxes ("STBs"), amplifiers, AV receivers, CD players, game consoles, home lighting, drapery, fans, HVAC systems, thermostats, personal computers, etc. In a preferred embodi-

ment, controlling device **100** supports bidirectional communication **130** with AV receiver **102** via any convenient IR or RF protocol.

In an exemplary embodiment, controlling device **100** may be further adapted to function in cooperation with AV receiver **102** to configure the illustrative entertainment system in accordance with a user's desired activities. To this end, as illustrated in FIG. **2**, an exemplary controlling device may be provisioned with a series of activity selection keys or buttons **200** with designations such as, for example, "Watch TV", "Watch a Movie", "Listen to Music", "Play a Game", etc. Activation of such an activity selection key may cause AV receiver **102** and/or controlling device **100** to cooperatively place the exemplary home entertainment system into a user-specified state which has been associated with that activity, as will be described in further detail hereafter.

Turning now to FIG. **3**, for use in commanding the functional operations of one or more appliances, the controlling device **100** may include, as needed for a particular application, a processor **300** coupled to a ROM memory **304**, a RAM memory **305**, a key matrix **316** (e.g., hard keys, soft keys such as a touch sensitive surface overlaid on a liquid crystal (LCD), and/or an electroluminescent (EL) display), transmission circuit(s) and/or transceiver circuits) **310** (e.g., IR and/or RF), a non-volatile read/write memory **306**, a means **302** to provide feedback to the user (e.g., one or more LEDs, display, speaker, and/or the like), an input/output port **318** such as a serial interface, USB port, modem, Zigbee, WiFi, or Bluetooth transceiver, etc., and clock and timer logic **312** with associated crystal or resonator **314**.

As will be understood by those skilled in the art, some or all of the memories **304**, **305**, **306** may include executable instructions (collectively, the controlling device program memory) that are intended to be executed by the processor **300** to control the operation of the remote control **100**, as well as data which serves to define to the operational software the necessary control protocols and command values for use in transmitting command signals to controllable appliances (collectively, the command data). In this manner, the processor **300** may be programmed to control the various electronic components within the remote control **100**, e.g., to monitor the key matrix **316**, to cause the transmission of signals, etc. The non-volatile read/write memory **306**, for example an EEPROM, battery-backed up RAM, FLASH, Smart Card, memory stick, or the like, may additionally be provided to store setup data and parameters as necessary. While the memory **304** is illustrated and described as a ROM memory, memory **304** can also be comprised of any type of readable media, such as ROM, FLASH, EEPROM, or the like. Preferably, the memories **304** and **305** are non-volatile or battery-backed such that data is not required to be reloaded after battery changes. In addition, the memories **304**, **305** and **306** may take the form of a chip, a hard disk, a magnetic disk, an optical disk, and/or the like. Still further, it will be appreciated that some or all of the illustrated memory devices may be physically combined (for example, a single FLASH memory may be logically partitioned into different portions to support the functionality of memories **304** and **306** respectively), and/or may be physically, incorporated within the same IC chip as the microprocessor **300** (a so called "microcontroller") and, as such, they are shown separately in FIG. **3** only for the sake of clarity.

To cause the controlling device **100** to perform an action, the controlling device **100** is adapted to be responsive to events, such as a sensed user interaction with the key matrix **316**, etc. In response to an event, appropriate instructions within the program memory (hereafter the "controlling device operating program") may be executed. For example, when a function key is actuated on the controlling device **100**, the controlling device **100** may retrieve from the command data stored in memory **304**, **305**, **306** a command value and control protocol corresponding to the actuated function key and, where necessary, current device mode and transmit that command to an intended target appliance, e.g., STB **104**, in a format recognizable by that appliance to thereby control one or more functional operations of that appliance. It will be appreciated that the operating program can be used not only to cause the transmission of commands and/or data to the appliances, but also to perform local operations. While not limiting, local operations that may be performed by the controlling device **100** may include displaying information/data, favorite channel setup, macro key setup, function key relocation, etc. Examples of local operations can be found in U.S. Pat. Nos. 5,481,256, 5,959,751, and 6,014,092.

For selecting sets of command data to be associated with the appliances to be controlled data may be provided to controlling device **100** that serves to identify each intended target appliance by its make, and/or model, and/or type. Such data allows the controlling device **100** to identify the appropriate command data set within a library of command data that is to be used to transmit recognizable commands in formats appropriate for such identified appliances. Such a library of command data may be preprogrammed in controlling device **100**, downloaded into controlling device **100** as part of the setup process, or a combination thereof. The library of command data may represent a plurality of controllable appliances of different types and manufacture, a plurality of controllable appliances of the same type but different manufacture, a plurality of appliances of the same manufacture but different type or model, etc., or any combination thereof as appropriate for a given embodiment. In certain embodiments, such data used to identify an appropriate command data set may take the form of a numeric setup code (obtained, for example, from a printed list of manufacturer names and/or models with corresponding code numbers, from a support Web site, etc.) which may be entered via activation of those keys that are also used to cause the transmission of commands to an appliance, preferably the keys that are labeled with numerals.

Alternative device setup procedures known in the art include scanning bar codes, RFTD tags, or other indicia; sequentially transmitting a predetermined command in different formats until a target appliance response is detected; interaction with a Web site culminating in downloading of command data and/or setup codes to the controlling device, etc. Further, in embodiments such as that illustrated in FIG. **1**, set up of a controlling device **100** may be performed interactively in conjunction with AV receiver **102**, using a connected device such as TV **114** for GUI display and a database of codes and/or brand and model information stored locally on AV receiver **102** or located remotely on a PC or Web server and accessed via network connection **120**. Since such methods for setting up a controlling device to command the operation of specific home appliances are well-known, these will not be described in greater detail herein. Nevertheless, for additional information pertaining to setup procedures, the reader may turn, for example, to U.S. Pat. Nos. 4,959,810, 5,614,906, or 6,225,938 or to pending U.S. patent application Ser. No. 11/915,562, all of like assignee and all incorporated herein by reference in their entirety.

With reference to FIG. **4**, an exemplary AV receiver **102** may include, as needed for a particular application, a control processor **400** coupled to a memory **402** which may comprise any combination of ROM, RAM, and/or non-volatile read write memory; video and audio processing sections **404**, **406**;

a tuner **408** for reception of radio broadcast channels; a front panel **410** including user controls and/or a display; a remote control interface **412** for communicating with a controlling device (e.g. **100**); a network interface **414** for communication with a local and/or wide area network; audio inputs **420***a* through **420***c*; video inputs **424***a* through **424***c*; AV inputs **422***a* through **422***c*; audio outputs **430***a*, **430***b*; and video outputs **434***a* and **434***b*. As will be appreciated, audio and video inputs and outputs (which may be more or less in number than illustrated) may comprise analog or digital signals and exemplary AV receiver **102** may be provisioned with analog-to-digital (ADC) converters, digital-to-analog (DAC) converters, video decoders, HDMI encoder/decoders, CODECS, format converters, etc., all as necessary to implement the input/output switching and routing functionality. It will be further appreciated that the functionality of video and audio processing blocks **404** and **408** may be implemented in separate components such as a specialized digital signal processors (DSP), may be implemented as part of control processor **400**, or any combination thereof, and that portions of memory **402** may be allocated to or associated with audio and video processing blocks **404**,**408**.

It will also be appreciated that some or all of the memory elements **402** may take the form of a chip, a hard disk, a magnetic disk, an optical disk, FLASH memory, and/or the like, and that all or portion of the memory **402** may be physically incorporated within the same IC chip as the control processor **400** and/or audio or video processing blocks **404**, **406** and, as such, memory **402** is shown separately in FIG. **4** only for the sake of clarity.

As will be understood by those skilled in the art, some or all of the memory **402** may include executable instructions that are intended to be executed by the processor **400** to control the operation of the AV receiver **102** (hereafter, the "AV receiver operating program"). In this manner, the processor **400** may be programmed to control the various electronic components within the AV receiver, e.g., to monitor the front panel **410** and or remote control interface **412**, to cause the routing of video and/or audio signals between the various inputs and outputs, to control selection of radio broadcast channel by tuner **408**, to control volume and equalization settings of audio outputs **430***a* and **430***b*, etc. Further, the AV receiver operating program, in conjunction with video processing block **404**, may provide GUT-based setup menus for AV receiver functions such as input and output assignments, levels, balances, equalization, etc., via a connected video monitor device such as for example TV **114**. Since such GUI-based AV receiver setup is well known in the art, for the sake of brevity it will not be described further herein, however if greater detail is desired regarding such features and functionality the interested reader may reference, for example, a document such as the Denon AV Surround Receiver STR-DA5500ES Owner's Manual (D&M Holdings Inc. publication number 5411 10255 000D).

In addition, in an exemplary embodiment described herein the AV receiver operating program may include programming which functions in cooperation with controlling device **100** to define and subsequently execute user-desired configuration of the home entertainment system in accordance with various activities.

With reference to FIG. **5**, after completing the initial set up of AV receiver **102**, for example as described in the above referenced Denon STR-DA5500ES User's Manual, a user may wish to configure the functionality of the activity buttons **200** of controlling device **100**. To this end, she may place the AV receiver into an activity setup mode via, for example by a sequence of keypresses on controlling device **100**, use of navigation keys **210** of controlling device **100** to select a menu item displayed on TV **114**, or such other action as may be appropriate for a particular embodiment. Upon entering activity setup mode, the AV receiver operating program may display an exemplary initial status message **530** on TV **114** prompting the user to select an activity to configure. The AV receiver operating program thereafter waits at step **502** for user input, i.e. activation of one of the activity buttons **200** of controlling device **100**. In the illustrated example, the to user may select button **202** labeled "Watch a Movie", resulting in communication by the controlling device **100** of an appropriate key command value to AV receiver **102**. Upon receipt of the "Watch a Movie" activity command, at step **504** the AV receiver operating program may display a listing **532** of available source devices that are known to be connected to inputs **422**, **424** of AV receiver **102**. In this context it will be appreciated that the earlier-mentioned initial setup procedures of AV receiver may include user labeling/identification of the devices connected to the various inputs together with a selection of compatible command data sets within universal controlling device **100**, and the resulting user friendly labels such as "DVD player", "Projector", etc. may be used thereafter in the generation of displays such as that illustrated at **532**. Additionally, the displayed listing may be further tailored by the AV receiver operating program to include only those currently-configured devices known to be compatible with the specified activity—for example, for the presently illustrated "Watch a Movie" activity devices which are incapable of sourcing a video stream, such as CD player **112** or tuner **408** may be omitted from the list presented to the user. At step **506**, the user may employ navigation keys **210** of controlling device **100** to move a cursor **536** and select desired source device(s). One or more source devices may be selected, as indicated for example by indicia **534**. In the event more than one source device is designated, the user may be prompted at activity execution time to select the desired source, as will be described in further detail hereafter in conjunction with FIG. **6**.

Upon completion of source device selection, at step **508** a list **538** of possible destination devices may be displayed for user selection at step **510** in a similar manner to that described above. Once again, the list of devices may be tailored by the AV receiver operating program to include, in this case, only those currently-configured devices known to be capable of rendering the designated input media stream(s). Although not shown, it will be appreciated that other configuration options may also be presented to the user in certain embodiments, for example, selection of a destination for audio output. Once all user selections have been made, at step **512** the activity configuration parameters may be finalized and stored in AV receiver memory **402** for future use in configuring the home entertainment system when the indicated activity is called for, e.g., the final configuration is stored and associated with the received key command value corresponding to the activity key that was activated at the start of the configuration process. Thereafter, the AV receiver operating program may display a completion message **540**, including in this example a reminder **542** that final source selection will be required at execution time. At step **516**, the user indicates whether she wishes to set up another activity, in which case processing returns to initial step **502**. If not, activity setup is complete and the AV receiver operating program exits setup mode and returns to normal operation.

The execution of an exemplary activity configuration request will now be discussed in conjunction with FIG. **6**. Upon actuation of an activity button on controlling device **100**, for example **202** "Watch a Movie" and receipt of the

resulting appropriate key command value communication by AV receiver **102**, assuming the AV receiver operating program is in the normal operation state (i.e. not in setup mode as described previously), at step **602** the AV receiver operating program first determines if the activity by the key command value received from the controlling device has in fact been configured. If not, at step **624** an error message is displayed, for example on TV **114**, prompting the user to first configure that activity, and the activity request is ignored. If the activity has been configured, at step **604** the AV receiver operating program next determines from the configuration associated with the received key command value if multiple sources were configured. If so, at step **606** the options are displayed as illustrated at **630** and the user is prompted to select a desired source device, for example, by using the navigation and selection keys of the controlling device to highlight and select the desired source device. As will be appreciated, if only one source device was configured at setup time, this step may be skipped. Once a source device has been designated, at step **608** the AV receiver operating program selects the audio, video and/or AV inputs associated with the designated source device. At step **610**, the AV receiver operating program determines if the selected source device is powered on, for example by detecting presence or absence of audio/video signal, sensing HDMI status, etc. as appropriate for the device connection in question. Alternatives such as power sensing, etc. may also be available in certain embodiments. If the selected source device is not powered on, in a preferred embodiment at step **612** a request may issued to controlling device **100** via bidirectional communication link **130** to transmit a "power on" command to the source appliance. As will be appreciated, such a request would include data that functions to indicate to the controlling device **100** the intended target appliance for the "power on" command. Thereafter, at step **614** the AV receiver operating program determines if multiple destinations were configured. If so, at step **616** the options are displayed as illustrated at **632** and the user prompted to select a desired destination device as described above. Again, if only one destination device was configured at setup time, this step may be skipped. At step **618**, the AV receiver operating program determines if the selected destination device is powered on, for example by sensing HDMI status. Alternatives such as detection of AV signals from an auxiliary output of a rendering device, power sensing, etc. may also be available in certain embodiments. If the selected destination device is not powered on, in a preferred embodiment at step **620** a request may be issued to controlling device **100** via bidirectional communication link **130** to transmit a "power on" command to the destination appliance.

While initiation of a "Watch a Movie" activity via key **202** may result in automatic configuration of keys of the controlling device, e.g., transport keys **240** may be configured to transmit commands in a format compatible with whichever of appliances **104**, **106**, **108** have been pre-configured as the media source within the remote control when in the "Watch a Movie" activity mode, in the event that multiple possible sources (or destinations) are possible in the "Watch a Movie" activity mode (which does not allow for a pre-configuration of the keys of the controlling device to a particular appliance), at step **622** data indicative of the appliances to be controlled in the currently selected activity mode may be transferred over bidirectional communication link **130** from the AV receiver operating program to controlling device **100** to cause the controlling device to configure itself to match the activity and selected source and destination appliances. It will also be appreciated that keys of the controlling device **100** may, in whole or in part, be matched to an intended target appliance as a result of receipt of the aforementioned requests to power-on a device and, as such, step **622** can be skipped if this data has already been provided to the controlling device by the AV receiver.

Although not illustrated in the example of FIG. **6**, in certain embodiments additional appliance configuration may be initiated by the AV receiver operating program and/or the controlling device operating program and performed by controlling device **100**, for example issuance of commands for selection of an appropriate input on TV **114** or projector **118**, adjustment of video aspect ratio or picture settings to optimize presentation of the selected source material, etc. Also, additional actions may be initiated by the AV receiver operating program and/or the controlling device operating program with respect to appliances not participating in an activity. For example, initiation of a "Listen to Music" activity may cause the controlling device itself, or result in the issuance of requests to controlling device, to power off video display devices such as TV **114** or projector **118**.

In addition to the interactions with AV receiver **102** described above, in certain embodiments the activation of an activity selection button **200** may also invoke a conventional controlling device-based macro command sequence as is known in the art and described, for example, in the previously referenced U.S. Pat. No. 5,959,751. Such macro sequences may be programmed by a user to, for example, adjust lighting levels, control drapes, etc. to create an environment suitable for the commanded activity, as well as to perform additional entertainment appliance configuration functions if desired.

Turning now to FIG. **7**, in an alternative embodiment, a PC based activity setup application may be offered in place of or as an alternative to the AV receiver GUI based setup previously described above in conjunction with FIG. **5**. Such a PC based setup option may comprise a locally installed application program, a Web application, or a combination thereof. As illustrated in FIG. **7**, the PC based setup application may comprise a GUI **700** which offers a series of drop-down menus **702**, **704** from which the various configuration options may be selected. In the illustrative example, separate panels **706** and **708** allow selection and configuration of sources and outputs of an activity and selection and assignment of appliance/controlling device key functionality for that activity, respectively. As will be understood by those of skill in the art, in general two drop-down menus such as **710** and **716** may not be active the same time, they are however illustrated as such in FIG. **7** to assist in a better understanding of the PC application. Drop down menu panel **706** may offer AV receiver related activity configuration choices similar to those previously described in conjunction with FIG. **5**, and, to avoid repetition, these will not be repeated. In the illustrated exemplary embodiment, drop down menu panel **708** allows the controlling device key groups for volume control, channel changing and transport to be pre-configured as appropriate. As an aid to the user, in some embodiments an image **712** of controlling device **100** may be displayed with the affected key group highlighted—for example, when the drop down menu **710** for transport keys is active, this group of keys **714** may be highlighted in displayed image **712**. In some embodiments, default key assignments may be dynamically established and displayed in panel **708** by the PC application based upon the current activity configuration settings. By way of example, if audio output for an activity is assigned to a set of speakers **718** connected to the output of AV receiver, the default volume key assignment **722** may be the AV receiver, whereas if the audio output for the same activity were to be assigned to the TV device **720**, the default volume control key assignment may be the TV device. In this context, it will be appreciated that in

certain embodiments provision may be made for uploading existing activity configuration settings from an AV receiver into the PC application for editing, by a user, in which instance the existing values may become the default settings. It will be appreciated that in instances where more than one input or output device has been selected for an activity and the final choice is to be made at execution time as previously described, some or all of the drop down menu items in key configuration panel **708** may be omitted or replaced with generic designators such as "Audio destination device" or "Video source", etc.

Once all aspects of the activities match a user's requirements, the user may cause the resulting configuration data to be downloaded into the exemplary AV receiver **102**, for example via network interface **120** if both the PC and AV receiver are connected to the same network. Alternatively, configuration data may be uploaded to a remote server for subsequent download to the AV receiver, copied to a memory stick or smart card for physical transfer, etc. Additionally, controlling device **100** may be coupled to the PC and become the repository for some or all of the configuration data, either for later transfer to AV receiver **102**, or for direct action by controlling device **100**.

In certain embodiments, the operating software of AV receiver **102** may be adapted to detect changes in connected appliances, for example by monitoring disconnection/reconnection of interface cabling, by observing changes in source or sink equipment identity or capability data reported over an HDMI or other digital connection, by noting an alteration in the bit rate or format of an input data stream, by detecting connection of an interface cable or presence of a new audio/video signal at a previously unused AV receiver input, or any other appropriate method. In such instances, the operating software of AV receiver **102** may cause to be displayed on a connected appliance, for example TV **144**, a reminder message to the user that controlling device **100** may require to be set up to operate the newly-configured appliance. Display of such a reminder message may be immediate upon detection of the change, may occur upon receipt of the next user command from controlling device **100**, or may be deferred until the newly added or changed appliance is selected as an input or output, either directly or as a participant in an activity. As illustrated in FIG. **8**, such a reminder message **800** may offer a choice **802** of immediately entering an interactive setup mode in which a database of command data sets and/or brand and model information stored locally on AV receiver or located remotely on a PC or Web server may be searched and an appropriate command data set identified to or downloaded into controlling device **100**; or display of the reminder may be cancelled **806** or deferred **804**.

In a further embodiment, the operating software of controlling device **100** may be adapted to always echo certain commands to AV receiver **104**, that is, upon actuation of certain functional keys, controlling device **100** may sequentially transmit first a keypress notification to AV receiver **104** and thereafter the appropriate command data in the format recognizable by the current target appliance. Using the received keypress notification data, the operating software of AV receiver **104** may be adapted to monitor the AV inputs and outputs for the expected result of a user appliance command. If the expected result does not occur, an error message may be displayed to prompt the user to retry the command, check the operating mode of controlling device **100**, etc. For example, if the currently selected activity is "Watch a Movie" and the operating software of AV receiver **104** is notified by controlling device **100** that the "Play" key **204** has been actuated, the operating software of AV receiver **104** may inspect the DVD player input to discern if a corresponding change in AV input data has occurred, for example an audio component has become present in a digital data stream where there was none before. Alternatively, the operating software may monitor the reported user activity on controlling device **100** for patterns indicative of a problem. For example, repeated actuation of the "Play" key **204** within a short space of time may indicate that an expected appliance response has not occurred. In either case, a message such as illustrated in FIG. **9** may be presented on a connected display such as TV **114** to assist the user in resolving the problem.

While various concepts have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those concepts could be developed in light of the overall teachings of the disclosure. For example, while described in the context of an AV receiver acting a central switching point for content streams in a home entertainment system, it will be appreciated that any other suitably equipped device, for example an advanced cable or satellite STB, a personal computer, etc., may be substituted for an AV receiver in the practice of the instant invention. Further, while a preferred embodiment described above comprises a controlling device capable of bidirectional communication with an AV receiver or other central switching device, it will be appreciate that many of the steps of the inventive methods may also be practiced in a system comprising a controlling device which is in unidirectional (inward) communication with the central switching device, in which case certain controlling device actions may be initiated autonomously as macro sequences using, for example, discrete appliance commands as are know in the art. Furthermore, in the case of a unidirectional controlling device, it is contemplated that, in lieu of receiving appliance indicating data from the AV receiver, the controlling device may be programmed whereby activation of a particular device mode key, e.g., cable, DVD, game player, etc., is used by the controlling device to configure groups of keys of the controlling device to communicate commands to a one of plural possible sources and/or destination appliances in a give activity mode, for example by activating the desired mode key(s) within a predetermined period of time after activation of the activity mode key when used to place the controlling device and AV receiver into that activity mode. Activation of a device mode key in this manner may also be used to cause the transmission of data to the AV receiver to thereby cause the AV receiver to select one of multiple possible sources and/or destinations in lieu of the menu navigation/selection method that was also previously described.

Still further, while described in the context of functional modules and illustrated using block diagram format, it is to be understood that, unless otherwise stated to the contrary, one or more of the described functions and/or features may be integrated in a single physical device and/or a software module, or one or more functions and/or features may be implemented in separate physical devices or software modules. It will also be appreciated that a detailed discussion of the actual implementation of each module is not necessary for an enabling understanding of the invention. Rather, the actual implementation of such modules would be well within the routine skill of an engineer, given the disclosure herein of the attributes, functionality, and inter-relationship of the various functional modules in the system. Therefore, a person skilled in the art, applying ordinary skill, will be able to practice the invention set forth in the claims without undue experimentation. It will be additionally appreciated that the particular concepts disclosed are meant to be illustrative only and not

limiting as to the scope of the invention which is to be given the full breadth of the appended claims and any equivalents thereof.

All patents cited within this document are hereby incorporated by reference in their entirety.

What is claimed is:

1. A method for using an entertainment device to notify a user of a change in an audio visual entertainment system configuration in which at least one of a plurality devices is connected to the entertainment device as an audio and/or visual source and at least one of the plurality of devices is connected to the entertainment device as an audio and/or visual output destination for the entertainment device, the method comprising:

causing the entertainment device to determine if there is a change in one or more of the plurality of devices connected to the entertainment device; and

in response to the entertainment device determining that there is a change in one or more of the plurality of devices connected to the entertainment device, using the entertainment device to cause a display by at least one of the plurality of devices connected to the entertainment device as a visual output destination for the entertainment device a message that serves to notify the user of the change in the audio visual entertainment system configuration;

wherein the message comprises a user interface element selectable to place a remote control device into a mode for configuring the remote control device to command functional operations of one or more of the plurality of devices connected to the entertainment device.

2. The method as recited in claim **1**, wherein the entertainment device waits for the receipt of a command from a remote control before causing the message to be displayed.

3. The method as recited in claim **1**, wherein the entertainment device causes the message to be displayed in immediate response to the entertainment device determining that there is a change in one or more of the plurality of devices connected to the entertainment device.

4. The method as recited in claim **1**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in one or more cables connected to the entertainment device.

5. The method as recited in claim **1**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in one or more input signals being provided to the entertainment device.

6. The method as recited in claim **1**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a new input signal at one or more inputs of the entertainment device.

7. The method as recited in claim **1**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in identifications provided to the entertainment device from the plurality of devices connected to entertainment device.

8. A method for using an entertainment device to notify a user of a change in an audio visual entertainment system configuration in which at least one of a plurality devices is connected to the entertainment device as an audio and/or visual source and at least one of the plurality of devices is connected to the entertainment device as an audio and/or visual output destination for the entertainment device, the method comprising:

causing the entertainment device to determine if there is a change in one or more of the plurality of devices connected to the entertainment device; and

in response to the entertainment device determining that there is a change in one or more of the plurality of devices connected to the entertainment device, using the entertainment device to cause a display by at least one of the plurality of devices connected to the entertainment device as a visual output destination for the entertainment device a message that serves to notify the user of the change in the audio visual entertainment system configuration;

wherein the entertainment device waits for the entertainment device to be placed into a mode in which a changed one or more of the plurality of devices connected to the entertainment device is to be used as an audio and/or visual source or as an audio and/or visual output destination for the entertainment device before causing the message to be displayed.

9. The method as recited in claim **8**, wherein, the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in one or more cables connected to the entertainment device.

10. The method as recited in claim **8**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in one or more input signals being provided to the entertainment device.

11. The method as recited in claim **10**, wherein the entertainment device monitors the one or more input signals for a change in transmission bit rates to determine if there is a change in one or more of the plurality of device connected to the entertainment device.

12. The method as recited in claim **8**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a new input signal at one or more inputs of the entertainment device.

13. The method as recited in claim **8**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in identifications provided to the entertainment device from the plurality of devices connected to entertainment device.

14. The method as recited in claim **8**, wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in capabilities provided to the entertainment device from the plurality of devices connected to entertainment device.

15. A method for using an entertainment device to notify a user of a change in an audio visual entertainment system configuration in which at least one of a plurality devices is connected to the entertainment device as an audio and/or visual source and at least one of the plurality of devices is

connected to the entertainment device as an audio and/or visual output destination for the entertainment device, the method comprising:

causing the entertainment device to determine if there is a change in one or more of the plurality of devices connected to the entertainment device; and

in response to the entertainment device determining that there is a change in one or more of the plurality of devices connected to the entertainment device, using the entertainment device to cause a display by at least one of the plurality of devices connected to the entertainment device as a visual output destination for the entertainment device a message that serves to notify the user of the change in the audio visual entertainment system configuration;

wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in one or more input signals being provided to the entertainment device and wherein the entertainment device monitors the one or more input signals for a change in transmission bit rates to determine if there is a change in one or more of the plurality of device connected to the entertainment device.

16. A method for using an entertainment device to notify a user of a change in an audio visual entertainment system configuration in which at least one of a plurality devices is connected to the entertainment device as an audio and/or visual source and at least one of the plurality of devices is connected to the entertainment device as an audio and/or visual output destination for the entertainment device, the method comprising:

causing the entertainment device to determine if there is a change in one or more of the plurality of devices connected to the entertainment device; and

in response to the entertainment device determining that there is a change in one or more of the plurality of devices connected to the entertainment device, using the entertainment device to cause a display by at least one of the plurality of devices connected to the entertainment device as a visual output destination for the entertainment device a message that serves to notify the user of the change in the audio visual entertainment system configuration;

wherein the entertainment device determines that there is a change in one or more of the plurality of devices connected to the entertainment device in response to the entertainment device detecting a change in capabilities to perform a functional operation provided to the entertainment device from the plurality of devices connected to entertainment device.

17. A method for using an entertainment device to notify a user of a perceived problem in a configuration of a controlling device used to control functional operations of an audio visual entertainment system in which at least one of a plurality devices is connected to the entertainment device as an audio and/or visual source and at least one of the plurality of devices is connected to the entertainment device as an audio and/or visual output destination for the entertainment device, the method comprising:

receiving by the entertainment device a signal from the controlling device having data indicative of a command to have one or more of the plurality of devices connected to the entertainment device perform a functional operation wherein performance of the functional operation is detectable by the entertainment device; and

in response to the entertainment device failing to detect performance of the functional operation after receipt of the signal, using the entertainment device to cause a display by at least one of the plurality of devices connected to the entertainment device as a visual output destination for the entertainment device a message that serves to notify the user of the perceived problem in the configuration of a controlling device, wherein the entertainment device monitors at least one of inputs and outputs of the entertainment device associated with the one or more of the plurality of devices connected to the entertainment device as an audio and/or visual source to detect performance of the functional operation.

18. The method as recited in claim **12**, wherein the command to have one or more of the plurality of devices connected to the entertainment device perform a functional operation comprises a command to control playing of media by one or more of the plurality of devices connected to the entertainment device as an audio and/or visual source.

19. A method for using an entertainment device to notify a user of a perceived problem in a configuration of a controlling device used to control functional operations of an audio visual entertainment system in which at least one of a plurality devices is connected to the entertainment device as an audio and/or visual source and at least one of the plurality of devices is connected to the entertainment device as an audio and/or visual output destination for the entertainment device, the method comprising:

receiving by the entertainment device a signal from the controlling device having data indicative of a command to have one or more of the plurality of devices connected to the entertainment device perform a functional operation; and

in response to the entertainment device receiving the signal from the controlling device a predetermined number of times within a predetermined period of time, using the entertainment device to cause a display by at least one of the plurality of devices connected to the entertainment device as a visual output destination for the entertainment device a message that serves to notify the user of the perceived problem in the configuration of a controlling device.

* * * * *